THE CRITICAL PATH

A FLIGHT PROJECTS DIRECTORATE PUBLICATION ■ 2017 WINTER ISSUE

JPSS-1 SOARS INTO SPACE

Joint Polar Satellite System changes name to NOAA-20

PAGE 8

TOTAL AND SPECTRAL SOLAR IRRADIANCE SENSOR-1

Finding its place in the sun

PAGE 25

KEEPING THE PACE

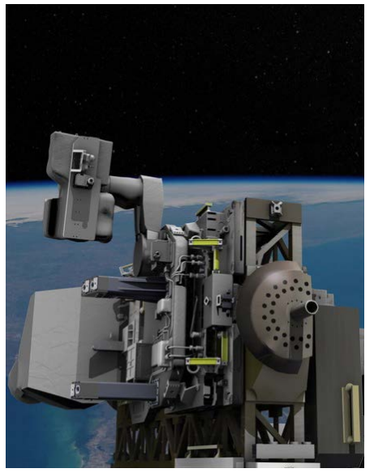
The task of defining a design-to-cost mission

PAGE 9

FLIGHT PROJECTS DIRECTORATE | Volume 25 • Number 3

Enabling exploration and earth + space science by transforming concepts and questions into reality

CONTENTS



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THE CRITICAL PATH

PUBLISHED BY THE FLIGHT PROJECTS DIRECTORATE

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HAVE A STORY IDEA, NEWS ITEM OR LETTER FOR THE CRITICAL PATH?
Please let us know about it.

Send your input to
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Don't forget to include your name and phone number.

The deadline for the next issue is March 30, 2018

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Once again the Flight Projects Directorate (FPD) has achieved major milestones over the past quarter. Most recently, the Joint Polar Satellite System (JPSS)-1 successfully launched from Vandenberg Air Force Base (AFB) on a Delta II launch vehicle on November 18. I witnessed the JPSS operations from both coasts, the first two countdowns while in the NOAA Satellite Operations Facility in Suitland, MD and the last countdown while onsite at Vandenberg AFB where the launch took place. Everything went off without a hitch; the years of development and training really paid off. The spacecraft is performing well thus far; kudos to the team for the years of effort.

Following its successful launch in August, the Tracking and Data Relay Satellite (TDRS)-M and the team have performed spectacularly in the checkout of the system on orbit and should be put into an official operational status in February.

The Total and Spectral Solar Irradiance Sensor (TSIS) solar sensor has been installed in the SpaceX Dragon "trunk" and is on schedule for a December launch from NASA Kennedy Space Center on its journey to the International Space Station. Not far behind are the launches of GOLD, TESS, GOES-S, and ICON.

In September I had the pleasure of visiting Goddard's JWST test team "on location" at the Johnson Space Center while they were in the midst of cryovac testing of the telescope. The test control room looked like "Goddard Southwest" as many of our project team members were onsite for the 100-day test. Years of planning paid off big time with the team executing the test on schedule, meeting all of its objectives,

CONTINUED ON PAGE 4

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and doing so in spite of Hurricane Harvey roaring through the local area in the middle of the test campaign. The dedication and resilience of this team was amazing. Congratulations on another big milestone being checked off on the journey to launch in 2019.

I also had the opportunity to see the Transiting Exoplanet Survey Satellite (TESS) spacecraft prior to its system-level environmental test program in Dulles, Virginia. As of this writing, TESS is in the midst of thermal vacuum testing that will continue through the Thanksgiving holiday weekend. Thanks to the TESS team for your commitment to this important Astrophysics mission.

A shout-out to the Wide-Field Infrared Survey Telescope (WFIRST) team for everything they did in supporting an external, independent review that was months in the making. The WFIRST team drew high praise from the review team of senior government, industry, and university experts. The WFIRST project is now working with Agency leadership to finalize the requirements for the mission as they make the run to System Requirements Review in the March timeframe.

As many of you have seen first-hand, the Flight Projects Directorate Office team has taken part in a series of building visits over the last couple of years to meet the FPD team members in their office areas. We are now going to expand the visits to include hardware visits within Goddard on a non-interference basis. It's great to get out and meet our people and witness the amazing work going on at the Center.

Preparations are already under way as we kick-start our 2018 summer internship season. The next few months will be busy as our projects identify mentors, secure funding, load student opportunities into our NASA intake tool, make selections, and order equipment to prepare for our students' first day on the job. I'm grateful for the dedication and investment our mentors are giving to our next generation of explorers!

You'll see in this edition of The Critical Path, a moving article on Craig Tooley. At a recent celebration of life held in his honor at the Goddard Recreation Center, there was a standing-room-only crowd, which included dozens of Craig's family and friends. Additionally, the Magnetospheric Multiscale (MMS) satellite operations control room at Goddard was renamed after Craig, a fitting tribute given all the years he worked on the MMS mission to make it a success. He is greatly missed by many at Goddard; truly, Craig was one of a kind.

It is my sincere hope that all of you can hit the pause button during this upcoming holiday season for time to relax, enjoy time with family and friends, and get recharged for an exciting 2018. Thank you for everything you do to make the Flight Projects Directorate a successful and great place to work.

Happy holidays.

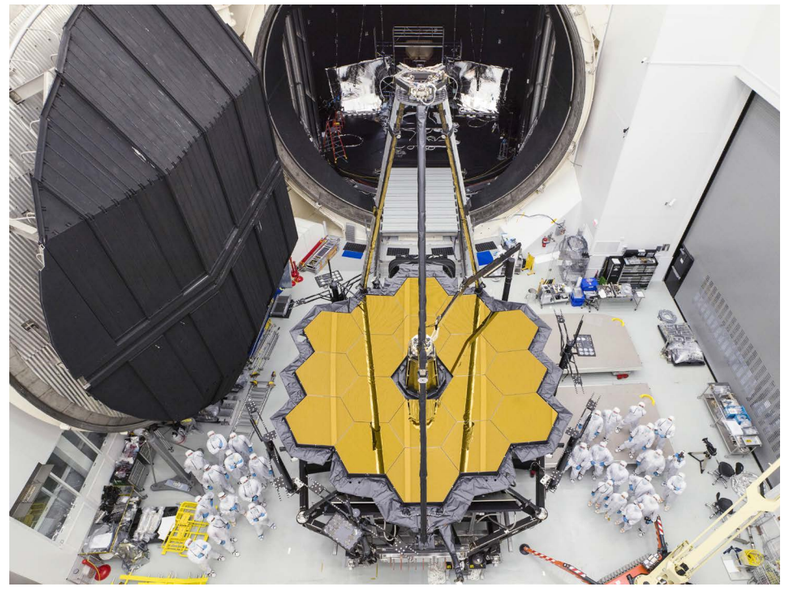
David F. Mitchell
Director, Flight Projects
david.f.mitchell@nasa.gov

A WORD FROM THE DEPUTY

In the first of a RECURRING SERIES of messages from the FPD deputies, WANDA PETERS, FPD Deputy Director for planning and business management, shares her thoughts on DIVERSITY AND INCLUSION.

The JWST combined Optical Telescope Element / Integrated Science Instrument Module (OTIS) has just completed 100 days of cryovac testing at Johnson Space Center. Shown at right is the OTIS and the roll-out team. See related story on page 33.

Credit: Chris Gunn

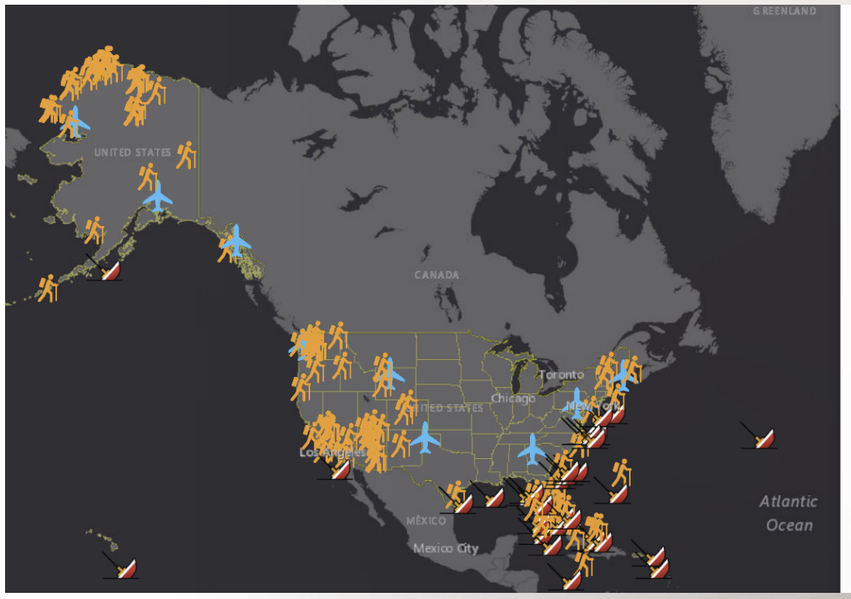


SAR

NASA'S SEARCH AND RESCUE (SAR) OFFICE, HELMED BY MISSION MANAGER, LISA MAZZUCA, DEVELOPS AND IMPROVES LIFE-SAVING DISTRESS BEACON TECHNOLOGIES.

Beyond SAR's tangible impact, 241 "SAR saves" this calendar year alone, they've made numerous additional contributions to the search and rescue community and the efforts of first responders worldwide.

Mazzuca and Tony Foster, deputy mission manager, promoted their research into aviation beacon survivability at Oshkosh, Wisconsin's AirVenture, the world's largest fly-in airshow. The report they publicized outlined installation best practices and gave crucial recommendations to beacon manufacturers and regulators. This guidance, based on a system-wide crash analysis, could improve beacon performance in crash environments.



Each icon on this map represents one rescue event, though multiple saves may be involved with each event. The Search and Rescue Satellite Aided Tracking (SARSAT) system is able to detect three types of beacons:

Personal Locator Beacons (PLBs)

Used primarily by hikers and outdoor enthusiasts

Emergency Position Indicating Radio Beacons (EPIRBs)

Used by commercial and recreation ships

Emergency Locator Transmitters (ELTs)

Used by civilian aircraft

COSPAS-SARSAT Rescues through November 16, 2017

- Number of people rescued in calendar year 2017 in the United States: 241
- Rescues at sea: 155 people rescued in 57 incidents
- Aviation rescues: 15 people rescued in 8 incidents
- Terrestrial PLB rescues: 71 people rescued in 55 incidents
- Worldwide – Over 41,000+ people rescued (since 1982)
- United States – 8,289 people rescued (since 1982)

During this hurricane season, SAR technologies helped first responders locate and rescue several victims of these natural disasters. Personal and maritime beacons activated by hurricane survivors worked through a global system that SAR has been advancing for over three decades. Testing continues on a newer, second-generation beacon technology, which provides improved distress signal tracking. These beacons use instruments in medium-Earth orbit to alert first responders faster and more accurately than first-generation technology. An international committee recently approved requirements for ground segments that support these beacons.

The Samuel J. Heyman Service to America Medals committee selected Mazzuca as a finalist in recognition of these efforts. She was also voted one of the top four finalists for their people's choice award. Mazzuca and division leadership attended a gala honoring her work on September 27, 2017. ▲

FOR MORE INFORMATION ABOUT SAR'S MISSION VISIT HTTPS://SAR.GSFC.NASA.GOV.

DANNY BAIRD / CODE 450
TECHNICAL WRITER , ESC DIVISION

JPSS-1 LAUNCHES TO ORBIT, BECOMES NOAA-20

The launch was the culmination of years of progress by the National Oceanic and Atmospheric Administration (NOAA), NASA, and industry partners to put into space NOAA's next generation of polar-orbiting weather satellites.

After two scrubbed launch attempts earlier in the week, and several days of strong high-level winds, JPSS-1 blasted off at 1:47 a.m. PST, inside a tight, 66-second launch window. The Delta II carrying JPSS-1, launched by United Launch Alliance, was the second-to-last rocket in the long-running series. The JPSS program is a collaboration between NOAA and NASA. The satellite is the first of four that will provide global weather and climate data over the next two decades, with a primary objective of providing the observations needed for 3- to 7-day forecasts.

"This is huge," said Greg Mandt, director of the JPSS program, said during live commentary after the launch. "JPSS-1 is part of a national polar orbiting weather satellite program, and we really need this because 85 percent of all the data from our weather forecast models come from this series of weather satellites. We're looking forward to getting good data from this satellite."

Though the satellite was known as JPSS-1 since work on the program began through launch, it was renamed NOAA-20 upon reaching orbit, following NOAA's naming convention for its polar orbiters. Its five instruments are essentially copies of those on Suomi-NPP research satellite, a joint NASA-NOAA mission that launched in 2011. However, given the new satellite was built for operational use, it was designed for a 7-year lifetime. With the Suomi-National Polar-orbiting Partnership (NPP) still operational, the two satellites will now work in tandem to provide global weather data.

JPSS group at the visitor center

On November 18, the Goddard-based Joint Polar Satellite System (JPSS) program reached a major milestone when the JPSS-1 satellite launched to orbit aboard a Delta II rocket from California's Vandenberg Air Force Base.

Patrick Lynch / Code 130
Office of Communications

CREDIT: YANICK ROMERO

KEEPING THE PACE

In January 2015, the Goddard Pre-Aerosol, Clouds, and ocean Ecosystem (PACE) team embarked on the task of defining the PACE mission. The expectation was that the mission would be different, insomuch that it was directed to be a design-to-cost (DTC) development.

Looking back, the biggest challenge with a DTC mission is in the eye of the beholder and an individual's interpretation of what DTC looks like in practice. [1] The project accepted the task of defining the DTC process and has stayed with the plan through the present. Throughout the formulation phase and through the design-to-cost process the PACE project executed more than 60 mission and element-level trades with the specific goal of maximizing the science return within the allocated $705M budget. Fast forward 3 years, the PACE project has successfully passed Key Decision Points A and B and entered Phase B in July 2017. The project has brought forward various, if not unconventional, ways of meeting the science objectives. The project now faces the larger challenge of the Administration's proposed budget cuts. This new challenge has provided the PACE science and management team with the opportunity to clarify the science benefits and educate the community. The project is actively and effectively making the case for "Keeping the PACE."

BUDGET CHALLENGE

With the new budget challenge, the project scientist (Dr. Jeremy Werdell) and his science team looked to ensure the larger community understood the benefits provided by the PACE mission. For the NASA research community, the PACE mission will make global ocean color measurements to provide extended data records on ocean ecology and global biogeochemistry (e.g., carbon cycle), along with polarimetry measurements to provide advanced data records on clouds and aerosols, as well as ocean color. Understanding the impacts and feedback of the Earth system to its climate is critically important to NASA and the science community. What is not widely known is that the PACE data will also be used by the Department of Defense (DOD), the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the commercial fishing industry. Dr. Werdell and his team developed a concise white paper to clarify the mission benefits and also enlisted commercial industry for feedback. Following are the white paper and typical quotes from the commercial fishing industry.

The U.S. ocean economy contributes over $350B to the GDP (2014) and supports more than 3.1 million jobs (one in 45). Currently, this ocean economy, including the Great Lakes, is growing faster than the total U.S. economy in both contributions to inflation-

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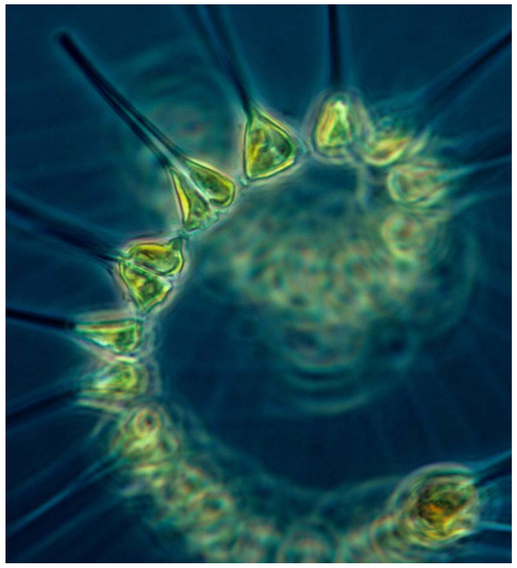
adjusted GDP (15.6% since 2007 compared to 5.8%) and jobs (8.1% compared to flat).

The ocean teems with life, supporting economies and food security and providing for our everyday health and welfare. Phytoplankton (microscopic marine plants and algae) form the base of our food chain, produce about half of the oxygen on Earth, and remove carbon dioxide from the atmosphere. Like land plants, they are very diverse, and not all phytoplankton are beneficial – harmful



algae can contaminate drinking water, kill fish, and close recreational areas. PACE will be the first mission to provide measurements that enable prediction of the boom-bust of fisheries, the appearance of harmful algae, and other factors that affect commercial and recreational industries. While current satellites provide essential tools for monitoring the ocean, coasts, and Great Lakes, they cannot effectively be used to evaluate changes to fisheries or identify harmful algae. Without PACE, we will continue to be blind to the impacts of diversity changes in our marine resources.

PACE will also observe clouds and microscopic airborne particles known as aerosols that scatter and absorb sunlight. Industry, DOD, NOAA, policy makers, and scientists all rely on these key data for weather, visibility, and air quality forecasts. Observing the ocean, clouds, and aerosols together will reveal previously unseen interactions, including their exchange of carbon dioxide, how some aerosols can fuel phytoplankton blooms, and how phytoplankton can release particles to the atmosphere that lead to the formation of clouds. These processes affect how much heat is trapped by Earth's atmosphere and are vital to accurately predict weather and climate.

Example PACE user communities:

- **Natural and coastal resource managers focused on water quality for human health, commercial fishing, and disaster management**
- **Researchers and Earth modelers in the fields of ocean biology-ecology-biogeochemistry, atmospheric aerosols, and clouds**
- **Military users of ocean optical data for environment characterization and clouds and aerosol data for weather and visibility forecasts for regions of operations**
- **Government agencies, including NOAA, USGS, and the EPA, who will use this data to manage fisheries and to determine human health predictors including air and water quality**
- **Renewable energy and commercial sectors with interest in environmental technology development, resources management tools, and environmental forecasting**
- **Educators of the general public**
- **Policy makers and economists at local, state, regional, tribal, federal, and international levels**

Ultimately, PACE will provide atmospheric and oceanic observations that benefit society in ways that current satellites cannot. For operational users, policy makers, the commercial sector, and scientists, PACE will offer new and advanced opportunities to monitor fisheries and harmful algae and improve our understanding of water resources, the impact of disasters, ecological forecasting and human heath, and air quality.

> **"Knowing the type of plankton my shellfish are eating at any given time greatly increases my awareness and informs my decision-making process. All this information helps me to be a better and more efficient fisherman which makes my business more sustainable.**
>
> **-Bernard Friedman, Santa Barbara Mariculture Co.**

> **"The commercial fishing business is not easy. As the ocean is warming, stocks are shifting northward. People who survive in this business are using this technology to find fish more efficiently, comply with all the rules and regulations and limit by catch and waste.**
>
> **-Capt. Bill Bright, Northwest Atlantic fishing fleet**

The project and the Center continue to be active in the community to make sure the value of the PACE mission is understood and advocates have the appropriate information. The PACE white paper can be accessed from the PACE website.

HTTPS://PACE.OCEANSCIENCES.ORG/DOCS/PACE_ECONOMY_SOCIETY.PDF

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MISSION STATUS

The results of the PACE pre-formulation and formulations phases defined a mission that has the Ocean Color Instrument (OCI) and the spacecraft developed within the Goddard gates. The Project also proposes to accommodate two smaller cubesat-style polarimeters from the University of Maryland Baltimore County (UMBC) and the Netherlands Space Office (NSO). The OCI promises to provide the science community

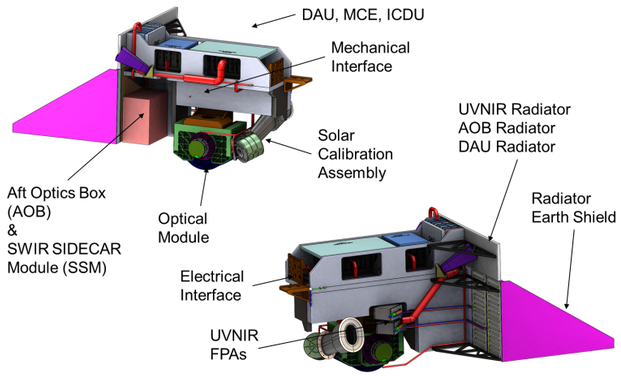


Figure 1. PACE Ocean Color Instrument Concept

with the first-ever global spectrometer (continuous 5nm resolution) with wavelengths from 320nm to 890nm, plus seven discrete shortwave infrared (SWIR) bands (940, 1038, 1250, 1378, 1615, 2130, and 2260nm). The polarimeters will measure key aerosol properties like aerosol optical thickness (AOT), as well as the absorption, size, shape, and type of aerosol particles, with accuracies that will allow the scientist to make a significant step forward in our understanding and quantification of the aerosol effect on climate. The polarimeters also compliment the OCI, in that they will assist in the atmospheric correction for improved ocean color data quality. The OCI instrument concept is shown in figure # 1 and the observatory concept is shown in figure # 2.

The DTC requirement has forced the team to continually look for cost-effective alternatives to meet the science objectives at the highest cost confidence. The utilization of the two smaller polarimeters is a prime example as they come with a low cost and the potential for a very high upside in atmosphere science. The polarimeters will be developed to a do-no-harm requirement that allows the instrument providers to define their science requirements and work collaboratively with the project science team. In keeping with the DTC philosophy, this should minimize the threat of cost growth. The OCI has undergone a similar process that looks for cost-effective implementation that results in collaboration with industry and takes advantage of the expertise outside the Goddard gates. The project plans to procure key elements of the instruments to maintain schedule and cost performance. This has allowed the instrument team to include capabilities (i.e., additional SWIR bands and onboard solar calibrators) that are not part of the threshold requirements.

Having the spacecraft team and the instrument team on the same project has allowed the project to share engineering and stagger the element start-up dates.

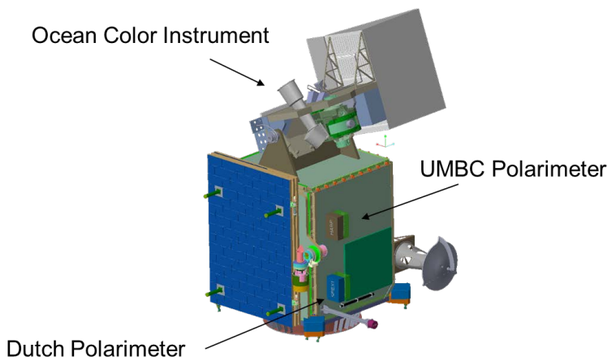


Figure 2. PACE Observatory

The staggered start-up affords the project the time to properly develop and flow the requirements from the instrument to spacecraft to ground system. The team has the flexibility of trading capability between the elements and reduce cost impact and/or risk to the mission. A recent example would be the tilt system for the instrument. Early on in the project, the team determined the tilt function should reside with the OCI. Follow-on assessments led to a change in that decision and located the function on the spacecraft element. The decision would not have been possible, without significant cost impact, if the spacecraft was built outside of Goddard. The second example of the benefits of the DTC process is in the implementation of the two polarimeters. Early in 2015 the project has been exploring opportunities to include a polarimeter instrument to satisfy the mission science objectives. The project continued to look for collaboration and procurement opportunities for a larger, more capable instrument. Analysis showed that the project cost and schedule confidence were not sufficient and the project abandoned the options. Late in the flow, the project identified the two smaller instruments from the Netherlands and UMBC. Combined, the two instruments provide most of the capability listed in the PACE Science Definition Team report.

LOOKING FORWARD

With the project in Phase B, the team is furthering the element designs and preparing for the Preliminary Design Reviews. The team and Center continue to interact with the larger community to ensure the mission capabilities and benefits are understood. The project continues to enjoy success using the DTC process and remains on plan and within budget. The project recently held a town hall meeting to ensure the larger PACE team understands the budget status and the mission goals (see team photo). The ultimate decision on 'Keeping the PACE' will play out when the Administration passes the budget. Until then the team feels confident in the outcome and is keeping with the plan. ▲

PACE team
Credit: Bill Hrybyk

ANDRE' DRESS / CODE 427
PACE PROJECT MANAGER

Where were you for the Solar Eclipse 2017?

Millions of Americans will remember what they did during the 2017 eclipse for the rest of their lives. But for a small cadre of education and communications specialists at NASA's Goddard Space Flight Center, the planning leading up to the eclipse started more than three years before.

For the heliophysics communications team, the 2017 solar eclipse was their "7 Minutes of Terror" and a nationwide NASA social event all rolled into one. While the event was truly agency-wide and nationwide in its scope, the planning began here at Goddard.

The team was asked to develop products,


GSFC Director, Chris Scolese

posters, videos, visualizations etc., before anybody else at NASA was thinking about it, said Sun science public affairs official, Karen Fox. Planning quickly centered around a big event at Carbondale, Illinois, featuring the video cast NASA Edge. Carbondale is where the tracks of the 2017 and 2014 eclipses cross.

"Here's a good example of how Goddard worked well with a large, agency-level event," Fox said. "Big projects like this are like planning for a wedding, because you're working way ahead, and months in advance you're done, but everybody else still has their part to play. For the cake maker, they make a hundred cakes in the weeks before your event, now they're paying attention to your event. The better you have organized in advance, the better you're prepared for everyone else's panic at the last minute."

About the end of 2016, the NASA Headquarters heliophysics team began to take a larger, coordinating role, and everyone started paying attention, Fox said. A few months before the eclipse, the events took center stage with all of Headquarters communications as more and more centers and scientists took on-stage roles. Heliophysics funded 11 different eclipse-related science investigations, including two from Goddard.

Karen's deputy, Sarah Frazier, shepherded one of those through in Casper Wyoming. Frazier documented the setup, execution, and takedown of an experiment. She and some of the experimenters split their time between working on computer screens and ducking outside to view the progress of the eclipse.

"It was shocking how quickly it got dark," Frazier said. "At 50 to 60 percent coverage, it felt like it was getting dark, but the last few seconds before totality it got super-dark, super-fast." There were some instruments that kept taking data throughout the morning. It was more relaxed after totality, she said. Frazier also wrote several features about eclipse safety, visualization, and education. She worked with visualizers and producers on a whole slate of eclipse products.

The Eclipse event attracted many visitors to Goddard

Visualizer Ernie Wright, working out of planetary sciences, created the best map of the eclipse zone of totality ever done – taking into account the actual terrain on both Earth and the Moon using Lunar Reconnaissance Orbiter (LRO) data of the mountains and valleys the Sun would be peaking through.

The Goddard heliophysics team coordinated four live shots beginning in March, handled and triaged requests for communications, held media training for the entire agency, and coordinated events with other centers and NASA Headquarters.

Locally, they arranged purchase of eclipse glasses for all Goddard employees as well as two days of events at the Goddard Visitor Center and on Center.

Goddard scientists got into the act, including planetary geologist Noah Petro, and Sun scientists Nicholene Viall, Micheal Kirk, and Dean Pesnell, who traveled to Oregon to participate in various outreach events at the first on-land eclipse sightings.

At the Minor League Salem-Keizer Volcanoes baseball game, Noah Petro and the LRO team participated in an "EclipseFest" featuring the first ever "Eclipse Delay" in baseball history. https://www.youtube.com/watch?v=S07FO4GH0zc&list=PL_8hVmWnP_O2oVpjXjd_5De4EalioxAUi

Fox spent the actual eclipse with the NASA TV show in Charleston, South Carolina, where she said it was nice just to be there despite light cloud cover. "We could see the partial eclipse through the clouds," she said, "and we could feel the temperature drop and the winds change, but didn't get to see the corona during totality. Still, we got 75% of the experience. I'm really looking forward to 2024."

"I feel like it was a good test run for any big event that you have to connect across a long time across the country." ▲

Agency Eclipse 2017 site:
HTTPS://ECLIPSE2017.NASA.GOV/

Karle B. Hille / Code 130
Office of Communications


All eyes on the Sun

GETTING TO KNOW THE FACES OF 400

TODD GOOGINS

BORN:

Albany, NY

EDUCATION:

BM, Music Performance,
Ithaca College, Ithaca, New York

LIFE BEFORE GODDARD:

A child of the 70s, Todd grew up influenced by a wonderful musical mix in his hometown of Albany, NY. From gospel to rock, peppered with a healthy dose of his father's big-band vinyl, Todd was inspired to make a career as a vocalist and went on to earn a bachelor's degree in operatic performance from Ithaca College.

Upon graduation, he moved to New York City, where he became a session singer, demoing and recording for songwriters in multiple genres. This led to a stint in the world of teen angst television programs of the 90s, where his voice and original music were placed in shows such as Dawson's Creek and Party of 5.

Googins has also enjoyed a successful voiceover career, voicing commercials for AOL, Fox Television, Pfizer and Ford, among many others. Over the years, Todd delved into marketing, web and graphic design, eventually opening his own boutique marketing agency in Bethesda, MD.

LIFE AT GODDARD:

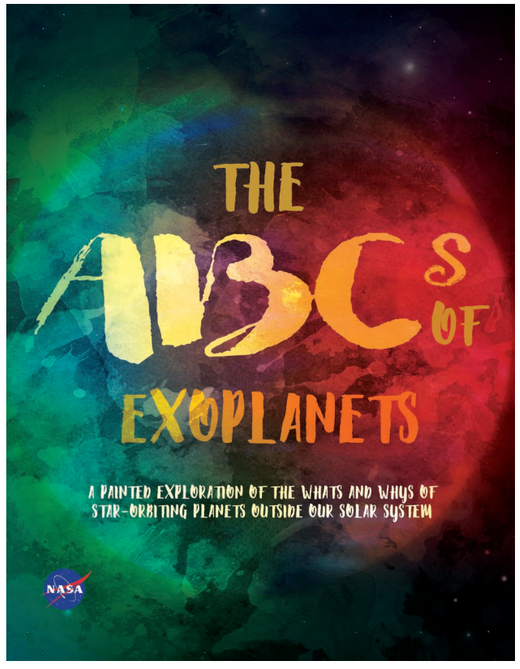
Todd began his career as a freelencer at Goddard, with his homebase in Code 400. He was immediately tasked with two projects involving long-time NASA brands; The Critical Path and the Tracking and Data Relay Satellite (TDRS) project.

> **Music marketing and mission outreach are very similar in nature. Both require taking complex concepts, be they emotional or technical, and distilling them in such a way that the audience or reader understands on a visceral level what makes them important to their lives.**
>
> **-Todd Googins**

TODD GOOGINS

The Critical Path was looking to develop a new look and layout for the magazine, and redesign its logo. Todd worked with Donna Swann, Laura Paschal, Paula Wood, Jen Poston and Maureen Disharoon to strike a successful balance that maintained the visual integrity of the existing brand while ushering in a more modern look. With the support of such a welcoming and creative team, he had a strong foothold to begin his NASA career.

At the same time, Todd began working with the folks at TDRS and Code 450's education and public outreach team, collaborating on the design of two 24x5-foot wall displays highlighting the history and importance of the TDRS project. With invaluable input and patience from technical writer Ashley Hume and alternate IPTL Carolyn Crichton, he created the installations currently in residence in the main lobby and south corridor of Building 12.



Cover page of the ABCs of Exoplanets for the Transiting Exoplanet Survey Satellite (TESS).

Shortly after that, Todd began work on a digital watercolor project for Matt Ritsko and the Transiting Exoplanet Survey Satellite (TESS). The new task, a wonderfully creative venture, was to produce a painted exploration alphabetically examining the inner workings of star-orbiting planets outside our solar system. The project should be released for public consumption soon.

Letter Q of the ABCs of Exoplanets for the Transiting Exoplanet Survey Satellite (TESS).

LIFE OUTSIDE OF GODDARD:

Todd is a proud husband to Karla Googins and father to their precious three-year-old daughter, Livia Joy. He still does voiceover work and performs as a singer with his band "Free Spirit" on the weekends. ▲

GETTING TO KNOW THE FACES OF 400

RUTHAN LEWIS

Ruthan currently serves the Exploration Systems Project as Exploration Systems and Habitation Manager, supporting the making of human exploration ventures beyond low earth orbit – lunar, deep space, and Mars. She also serves as Goddard's human systems integration representative to agency capability leadership and technical discipline teams.

BORN:

Bethesda, Maryland

EDUCATION:

Ph.D., Industrial and Biomechanical Engineering, Texas A&M University
M.S., Industrial and Biomechanical Engineering, Texas Tech University
M.Arch., Architecture,Catholic University
B.S., Architecture, University of Maryland
B.S., Biomechanics, University of Maryland

LIFE BEFORE GODDARD:

Ruthan has always been enamored with creating and understanding the holistic picture of the "unlimits" and capabilities of human performance from physicality to physiology to psychology, and behavior and transcendence of the human in extraordinary environments and under extraordinary conditions - how do we actually *live* in space and off the Earth?

Education has been key in Ruthan's life to help understand and nurture the interrelatedness between disciplines and processes. She began her career at NASA Johnson Space Center (JSC) as an experiment support engineer/scientist and astronaut trainer for Spacelab missions. Ruthan conducted biomechanical research and designed intra- and extra-vehicular crew interfaces to assist astronaut efficiency for the Space Shuttle and International Space Station (ISS).

> **"The intrigue of space and rarity of first-hand experience by humans off the Earth raises the looming question, how do we actually *live* in space and off the Earth?**
>
> **-Ruthan Lewis**

RUTHAN LEWIS

LIFE AT GODDARD:

Ruthan's career at GSFC began with support and crew systems leadership of satellite and spacecraft servicing and flight system design of the Explorer Platform, Upper Atmosphere Research Satellite, Compton Gamma Ray Observatory, and Hubble Space Telescope (HST).

After a detailee stint at NASA Headquarters in Advanced Concepts following the second HST servicing mission, Ruthan returned to GSFC as a mission manager, where she led teams that accomplished several national and international Shuttle Small Payloads missions and also served at JSC's Mission Control. Some of her fondest and most memorable NASA moments are from team interactions to training astronauts such as John Glenn on his historic return to flight.

Ruthan led an international STEM program, the first of its kind, entitled Space Experiment Module, which enabled students of all ages to create and participate in hands-on experiment and hardware development on the Space Shuttle and ISS. Ruthan was assigned the lead of GSFC's Research Management Office, which helped plan and coordinate ISS science payloads. Hearing that the agency was planning the return of humans to the Moon, Ruthan undertook further relevant studies, resulting in two post-doctoral degrees, a Master of Architecture and a Bachelor Science of Architecture. Her theses focused on lunar outpost design.

Following closure of the Small Payloads Office, Ruthan supported advanced concepts and formulation. At the same time, NASA's Constellation program, supporting the return of humans to the surface of the Moon, was progressing. Ruthan joined the agency teams to support mission formulation, surface research, and plans for lunar surface habitation. She led an intra-agency team to bridge human lunar exploration and science needs, scenarios, and technologies, and engaged as a team member in a variety of lunar surface analog studies.

When the Constellation program was discontinued, Ruthan transitioned to aidformulation of needs, assets, and architecture (figuratively and literally) for long-duration human habitation in deep space and on the Mars surface. Currently the agency is once again formulating the return of humans to the moon via cislunar space as a stepping stone to exploration beyond, and Ruthan continues as a member of agency and international teams to create systems to accommodate crew well-being and optimize exploration discovery and return.

LIFE OUTSIDE OF GODDARD:

Ruthan has always been active and an avid athlete with a love of nature and the outdoors and challenging physical adventures. She has a black belt in Tae Kwon Do, regularly works out with intensity training, strength training, and yoga, and kayaks, snowshoes, and cross-country skis. She adores her very active dogs and has participated in canine agility, hiking, etc. She's an amateur photographer and has had a number of her works exhibited around the area. She plays a variety of musical instruments and enjoys charcoal drawing and painting with watercolor. Though originally having space architecture in mind as she tackled her post-doctorate degrees, she can't hide the fact that she has always been enamored with architecture of all kinds on any planet. Ruthan has designed a variety of architectural works including interiors, exterior features, greenhouses, and furniture; and has also implemented those designs through woodworking and hands-on remodeling. Reflecting her love for education, Ruthan has taught graduate courses at the University of Maryland in space human factors, life support systems, and space simulation. Ruthan is a private pilot with instrument and visual flight rule qualifications and loves seeing and experiencing Earth and space through "micro" and "big picture" lenses from above, below, and within. ▲

July 1 through September 31, 2017

COMINGS

ROMAN A. KILGORE (from 360) to 448/Wide Field Infra Red Survey Telescope (WFIRST) project office, deputy payload systems manager

LAUREN B. HARDEN (from 603) to 428/Earth Science Mission Operations (ESMO) project, senior resources analyst

RYAN HANCOCK (from 210S) to 470/ Joint Polar Satellite System (JPSS) program, senior resources analyst

JULIE A. RIVERAPEREZ (from 210) to 474/JPSS Ground project, senior resources analyst

MARK A. WOODARD (from 584) to 451/Laser Communications Relay Demonstration (LCRD) project, observatory manager

DRUSCILLA D. PERRY (from 201) to 460/Explorers & Heliophysics Projects Division (EHPD), senior resources analyst

TAMMIE KEITH (from 703) to 420/ Earth Science Projects Division, resources analyst

JULIE A. MYERS (from 201) to 460/ EHPD, senior resources analyst

ALAIN P. WESCOTT (from 423) to 423/Earth Science Data and Information Systems (ESDIS) project, student trainee (accounting and budget)

TONYA L. CRYTSER (from 603) to 448/ WFIRST project office, financial management specialist

MARK D. WAGNER (from 603) to 458/ Space Network Ground Segment Sustainment (SGSS) project, financial management specialist

ALICIA R. JOSE (from 560) to 400/ Flight Projects Directorate (FPD), secretary

KENDALL D. MAULDIN (from 561) to 450.2/ Technology Enterprise and Mission Pathfinder Office (TEMPO), mission manager for Flight

PHILIP J. BALDWIN (from 566) to 450.2/TEMPO, mission manager for Ground

JEANNE DAVIS (from HQ-DH000) detail to 4502/ Laser-Enhanced Mission Navigation and Operations Services (LEMNOS) project, ground system manager

GOINGS

LISA G. KELLY ((from 470) – detail to 603/Business Management Officer

BRUCE KAMEN ((from 401) – detail to 300/Safety & Mission Assurance Directorate, Systems Review Branch, systems review manager

CATHERINE B. BARCLAY (from 450) – detail to HQ/Human Exploration and Operations Mission Directorate (HEOMD), Space Communications and Navigation Program (SCaN), network services division management integration manager

MICHAEL KIENLEN retired from 480/Satellite Servicing Projects Division (SSPD), project manager

STEPHANIE A. GRAY (from 403) – detail to 150/Chief Financial Office

GEORGE J. KOMAR (from 407) – retired from 407/Associate Director for the Earth Science Technology Office (ESTO)

FRANCIS M. GOESER (from 417) – retired from 417/ Geostationary Operational Environmental Satellite-R (GOES-R) instrument manager

REASSIGNMENTS, REALIGNMENTS & DETAILS WITHIN CODE 400

TENNETTA F. STARR (from 420) – detail to 460/ EHPD, senior resources analyst

BRENT ROBERTSON (from 484) to 401/Advanced Concepts & Formulation Office, instrument capture project manager

PATRICK E. BOLDOSSER (from 452) to 452/Space Network project, supervisory-deputy project manager

MATTHEW W. RITSKO (from 460) to 470/JPSS program, program business manager

JASON M. BALDESSARI (from 444) to 444/Space Science Mission Operations (SSMO) project, senior resources analyst

ELIZABETH A. PARK (from 472) to 450.2/TEMPO, mission manager for 2026 Optical Node

MELLANI EDWARDS (from 4900) to 2nd Flight Projects Development Program (FPDP) assignment to 490/ Instrument Projects Division, Resolve instrument project, administrative manager

PARAMESWARAN NAIR (from 429) to 429/Landsat-9 project, instrument manager for the Operational Land Imager 2 (OLI-2)

JACQUELINE F. FERGUSON (from 450.1) to 407/ESTO, resources analyst

VANESSA SOTO MEJIAS (from 448) to 2nd FPDP assignment to 420/Earth Science Projects Division, administrative manager

JOHN J. HUDIBURG (from 450.1) to 450.1/Networks Integration Management Office (NIMO), SCaN customer mission commitment manager

CHIKIA S. BARNES (from 450) to 441/Hubble Space Telescope (HST) Operations project, deputy project manager-resources

FERZAN JAEGER (from 490.1) to 499/L'Ralph instrument project, instrument project manager

STACEY BEALL (from 4500) to 450/Exploration & Space Communications Projects Division, SENSE financial management specialist

JACQUALINE R. PETERSON (from 490) to 490/Instrument Projects Division, supporting 492/High Resolution Mid-Infrared Spectrometer (HIRMES) instrument project, financial management specialist

KATIE M. BISCI (from 448) to 448/WFIRST project office, financial management specialist

AARON C. MCCLESKEY (from 490) to 448/WFIRST project office, financial management specialist

DEBORAH L. HINKLE (from 474) to 472/JPSS Flight project, financial management specialist

CELINA L. HANEWICH (from 130) to 403/FPD, Business Management Office, resources analyst

ZULMA PHILLIPS (from 480) to 480/SSPD, student trainee (administrative and office support)

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REORGANIZATIONS WITHIN CODE 400

INACTIVATED – 433/Origins, Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-Rex)

ESTABLISHED – 434/Lucy project

RENAMED – 492/Fast Plasma Instrument (FPI) instrument project to the High Resolution Mid-Infrared Spectrometer (HIRMES) instrument project

INACTIVATED – 494/OSIRIS Rex Visible and near-Infrared Spectrometer (OVIRS) instrument project

ESTABLISHED – 499/Lucy Ralph (L'Ralph) instrument project

RENAMED – 461/Magnetospheric Multiscale (MMS) project to X-ray Astronomy Recovery Mission (XARM) project

RENAMED – 490.2/Soft X-Ray Spectrometer (SXS) instrument project to Resolve instrument project

LISA HOFFMANN, CODE 400
ADMINISTRATIVE OFFICER

OUT & ABOUT

LIFE'S HIGHLIGHTS OFF CAMPUS

Congrats to Kerri Schappell who married Tyler Anderson on September 22nd! They enjoyed a small intimate wedding with about 35 of their closest family and friends at Lighthouse Sound in Bishopville, MD.

REMEMBERING CRAIG TOOLEY

GSFC lost a visionary, mentor, and friend, who will be dearly missed, this past September when Craig Tooley passed away. Craig came to Goddard in 1983 after receiving his bachelor's degree in mechanical engineering from the University of Evansville in Indiana, and he would earn a master's in the same field from the University of Maryland, College Park, in 1990.

He began his NASA career by working as a mechanical engineer in the Special Payloads Division, serving as the mission manager for five successful space shuttle-borne Spartan missions. Craig was also the Associate Head of the division's Carrier Systems Branch. He joined the Flight Projects Directorate in 1996, where he built a reputation as the "go-to guy" for some of NASA's highest-profile missions. Craig became deputy project manager for Triana, laying the groundwork for the climate observation mission which would later become DSCOVR. He helped develop procedures and train astronauts for the Hubble Space Telescope's fourth servicing mission in 2002. He then headed Hubble's Instrument Development Office, overseeing the development of instruments that were installed during the fifth and final servicing mission in 2009. In one of his most defining roles, Craig served as project manager for the Lunar Reconnaissance Orbiter (LRO), the Agency's flagship mission for better understanding our Moon. He transitioned into the same position for the Magnetospheric Multiscale (MMS) mission. After launching MMS, Craig became the Deputy Director for AETD.

Brent Robertson and Craig Tooley with MMS stack

I had the honor of working with Craig as his deputy project manager on MMS. MMS was a challenging mission. We did many things never done before. We built four spacecraft with 100 instruments. The mission required deployment of 32 booms, some of which stretch out the size of a baseball field. MMS is the only mission to formation-fly four spacecraft almost half way to the Moon. We hold two Guinness world records for the closest spacecraft formation flight and highest altitude GPS fix in the world.

Leading a mission like MMS done in-house at GSFC, where hundreds of people work for years to each make a critical contribution to its success, is very hard.

CONTINUED FROM PAGE 23

Leadership is about impact, influence, and inspiration, and Craig did it all. To lead it in a way that motivates everyone, where everyone feels heard and included, where everyone wants to work together to solve problems, where everyone has confidence that it can be done, where everyone knows it will be done right, is harder. I've worked with many people and I have not seen a better leader at NASA than Craig.

Craig was truly a gift to NASA and his legacy will last forever. He had influence far beyond his position and had impact on so many people. I have thought a lot about what made Craig so successful. Craig was a unique individual. How many of you know a NASA project manager who was a vegetarian and wore an earring? We used to drive together to attend meetings and one day while it was raining I noticed I was getting wet because his car was leaking. It became a joke between us that I would drive when it was raining. He knew what was important in life and didn't worry about material things. I think all of us can learn more by reflecting on some of Craig's qualities. I have written down a few.

CARING

It may not be the first quality you think of when you think about a NASA project manager, but Craig took great interest and cared about everyone that he worked with. Craig was very approachable and had an open-door policy. No matter how busy he was, he always made time to talk if you came by. Craig and I would talk about our families, which was so important to him. Craig always cared about each of us even as his time with us drew short. He knew that we would take comfort in receiving his news from California when he was sick. He shared his ups and downs with many of us regularly and we felt like we were there with him even though we were so far away. I talked with him as he was going into hospice care and even though he was weak, he wanted to know how everyone was doing and the latest going on at NASA.

PASSION

Life without passion is life not lived. Craig had a passion and vision for the discovery of space flight like no other. Craig saw the unlimited mysteries of the world we live in and knew how to go about unlocking them. Despite being very busy and having a lot of responsibility, he seemed to have unlimited energy. How many project managers are so enthusiastic that they do their own mission design by coding in Python for fun? Craig's enthusiasm was infectious. Craig developed a following of engineers, business associates, administrators, and technicians. Everyone wanted to work on the next project that involved Craig. You knew it would be challenging but worth the ride.

LEARNING

Craig had a thirst for knowledge and was always striving to understand the issues at hand. He always thought out of the box. When I first started working with Craig, I noticed that he was concentrating on his laptop a lot in meetings. I would glance over to see if he was distracted, and found that he would often be reading the latest journal article on the issue we were discussing. Whether it was the latest plasma theory for magnetic reconnection or understanding optocoupler failure methods, Craig was usually the most informed person in the room. He could be trusted to make the right decisions.

CONFIDENCE

Craig was a natural at communicating complex issues in a way that everyone could understand. He calmed many review boards with his command of the situation. Craig had a deep understanding of things and was able to organize his thoughts to present at will. He could speak about any aspect of the project and do it better that anyone I have ever seen. His confidence made everyone believe we could achieve the impossible.

Craig had a great impact on me. I told Craig as his time drew short that I often think, "What would Craig do?" when faced with situations, and that I will think this way the rest of my life. Craig and I stood side by side when he gave the "Go for Launch" for MMS. Giving a Go for Launch is such an honor, as you are representing hundreds of people that have worked years for its success. I told Craig the last time we talked that if I get to launch another mission, I know he will be there in spirit with me when I give the Go for Launch. ▲

BRENT ROBERTSON CODE 410
RESTORE-L PROJECT MANAGER

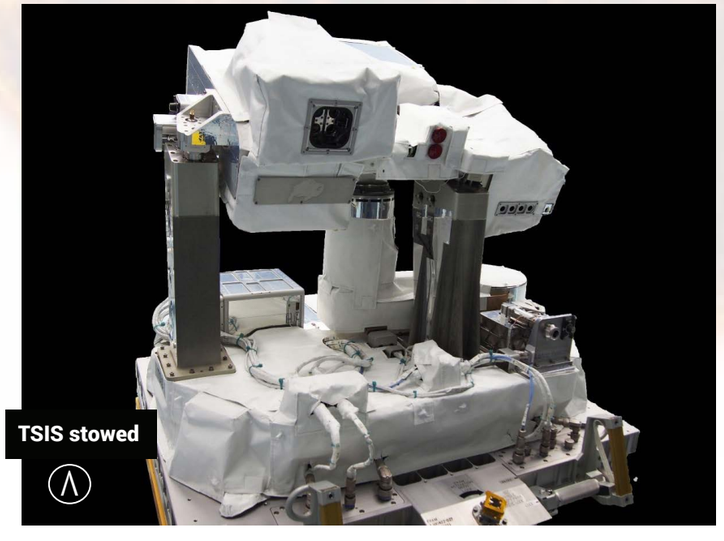
TSIS-1

FINDING ITS PLACE IN THE SUN

NASA's Total and Spectral solar Irradiance Sensor-1, or TSIS-1, is a mission to measure the Sun's radiative input to Earth. It is scheduled to be launched in late 2017 to the INTERNATIONAL SPACE STATION (ISS) to carry on the world's longest running space based Earth science measurement. This all started with Goddard's Nimbus Mission in 1978. The ISS is a football field-sized manned satellite with an orbit height of 370 km and an inclination of 52 degrees. It has the capability to accommodate multiple scientific instruments on its external structure and others in its pressurized modules.

TSIS-1 will provide a state-of-the-art set of solar irradiance measurements with unprecedented accuracy and precision. This data set is critical to the study the Sun's natural influence on Earth's ozone layer, atmospheric circulation, and ecosystems, and also provides essential information for accurate understanding of long-term solar variability and climate change.

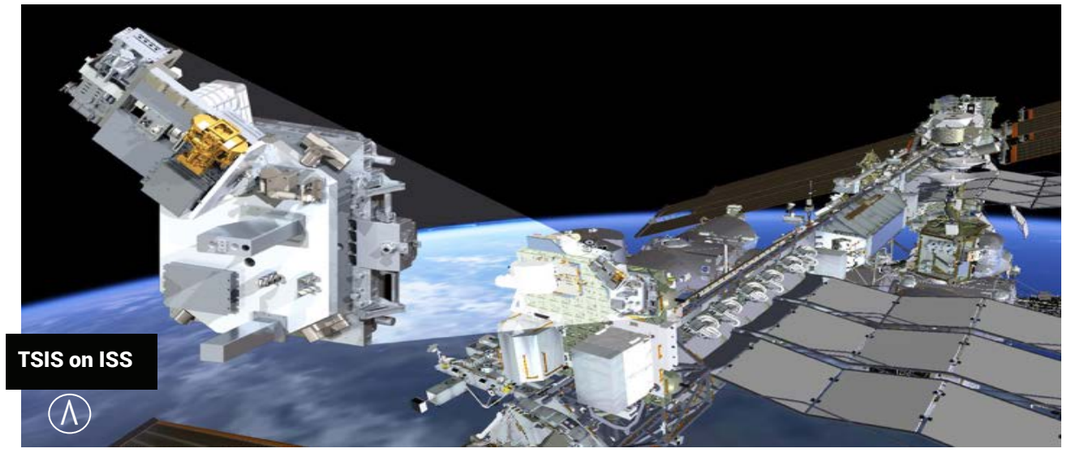
TSIS-1 is comprised of two instruments, the Total Irradiance Monitor (TIM) and the Spectral Irradiance Monitor (SIM). The TIM collects high accuracy, high precision measurements of total solar irradiance (TSI) using an active cavity radiometer. The SIM collects solar irradiance data as a function of wavelength using a prism spectrometer. Because the TIM and SIM are required to operate in a continuous solar orientation they are mounted on a two-axis gimbaled platform called the TSIS Thermal Pointing System (TPS) that provides precision pointing to the Sun independent of the ISS attitude.


TSIS stowed

The TSIS TIM and SIM are significantly upgraded versions of two instruments that are currently flying on NASA's Solar Radiation and Climate Experiment (SORCE) mission launched in January 2003 (over 14 years ago!). Another TIM is flying as the Total solar irradiance Calibration Transfer Experiment (TCTE) payload on the U.S. Air Force (USAF) Space Technology Program Satellite-3 (STPSat-3) launched in November 2013. The SORCE, TCTE and TSIS developer and operator is the University of Colorado Laboratory for Atmospheric and Space Physics (LASP) under contract to NASA GSFC.

TSIS mission planning, science data reception, health monitoring, and commanding are accomplished by the TSIS Science Operations Center (TSOC) at LASP in coordination with the ISS Payload Operations Integration Center (POIC) at NASA Marshall Space Flight Center. TSIS science data are recorded by the ISS; transmitted to the POIC and then routed to the TSOC. At TSOC the data is transferred to the TSIS Science Data System (TSDS) at LASP for calibration and data processing.

After resulting data products are validated for accuracy, they are sent to science data users through the NASA Earth Observing System Data and Information System (EOSDIS) through its Goddard Earth Sciences Data and Information Center (GES DISC) at GSFC. TSIS will operate from the ISS ExPRESS Logistics Carrier (ELC)-3 for 5 to 7 years.



TSIS on ISS

After installation at its site on the ISS, the TSIS instruments on the TPS are rotated out to provide clearance above the ISS to track the Sun each orbit.

International Space Station

SCIENCE BACKGROUND

Although there was an ambitious ground observing program during most of the past century, it provided only ambiguous estimates of irradiance, and little or no information on whether the Sun varied. This is because only a portion of the Sun's radiation penetrates the Earth's atmosphere to its surface; and at some wavelengths, the radiation is absorbed entirely. Space-based measurements therefore are required to accurately measure incoming solar radiation to Earth. Solar irradiance provides the only significant source of energy input to the Earth's climate system and its variability has the potential to either mitigate or exacerbate anthropogenic (human-made) change. One of the most important roles of the TSI record has been as a null argument, providing evidence that it is not the Sun driving observed global warming. Without a reliable mechanism in place (TSIS) to measure/model TSI, it will be difficult for scientists to accurately assess the natural components of the Earth's primary climate forcing agents. ▲

JOHN VAN BLARCOM / CODE 424
TSIS INSTRUMENT MANAGER

NASA
LASER COMMUNICATION PAYLOAD
Undergoing Integration and Testing

NASA's Laser Communications Relay Demonstration (LCRD) mission has begun integration and testing at NASA's GODDARD SPACE FLIGHT CENTER. The mission will demonstrate how a transition from radio to laser communications will exponentially improve the way we connect with astronauts and spacecraft.

"LCRD is a big step in the evolution of space communications," said Dave Israel, LCRD's principal investigator. "LCRD will demonstrate how laser communications technologies can be applied to significantly enhance the capabilities of NASA's communications infrastructure."

Until recently, NASA spacecraft have wholly depended upon radio communications. Now, NASA is developing cutting-edge laser communications technologies in a paradigm shift from exclusively radio communications to a hybrid of radio and laser.

Laser communications could provide 10 to 100 times better data rates than radio due to higher bandwidth. This means that laser communications can transmit more data at a time than radio, even though both communication types can only travel as fast as the speed of light. To transmit a 1-foot resolution "Google map" of the entire Martian surface, the best radio frequency communications system would take nine years to send all the data. Laser communications could do it in nine weeks. Additionally, laser communications systems take up much less size and weight for the same (or better) data rates than radio systems.

LCRD continues the legacy of the Lunar Laser Communications Demonstration (LLCD), which flew aboard a moon-orbiting spacecraft in 2013. Overall, compared to traditional communications systems on spacecraft today, LLCD used half the mass, 25 percent less power, and still transmitted six times as much data per second.

LCRD's flight support assembly arrived at Goddard in September. Here, technicians unload it from its shipping container. The flight support assembly is like the backbone for the payload. All of the LCRD components will attach to it, and it will attach them to the rest of the STPSat-6 spacecraft. Credit: Barbara Lambert

CONTINUED ON PAGE 28

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LCRD will pioneer the relay of data through lasers. The mission will demonstrate the feasibility and benefits of optical communications in future networks. Integration and testing, underway now at Goddard, is a crucial step in ensuring these technologies perform in the harsh environment of space.
"There are three phases to integration and testing leading up to launch," said Glenn Jackson, LCRD payload project manager.

LCRD engineers prepare Flight Modem 2 for vibration testing in October. The flight modems will fly on the spacecraft. They encode data into laser light that will then be transmitted to the ground.
Credit: Barbara Lambert

"We're on track to finish the first phase, payload integration, by the end of December. The next phase is to test the entire payload in a flight environment including electromagnetic, acoustic and thermal vacuum testing."

Testing takes place in Goddard's Environmental Test Engineering and Integration Facility, the "**CHAMBER OF HORRORS**." The facility ensures that every instrument is launch-ready, testing them under conditions mimicking launch and space.

A 42-foot tall acoustic test chamber exposes instruments to launch sounds equivalent to 150 decibels, or the volume of a jet take-off from 80 feet away. A thermal vacuum chamber chills the spacecraft to sub-zero temperatures in an artificial vacuum.

"Integration and testing is all about making sure the instruments are speaking to each other, working together," said Bill Potter,

LCRD's flight modems are a critical part of the payload. They encode data into laser light to be transmitted to the ground. In this photo, LCRD engineers are preparing Flight Modem 2 for vibration testing in October.
Credit: Barbara Lambert

project manager for LCRD's integration and testing activity. "We have a team of about 60 engineers across a number of disciplines making sure the device works as intended in the space environment."
Alongside testing at Goddard, NASA is calibrating Optical Ground Station 2, one of two ground stations that will communicate with LCRD. The station sits atop a mountain in Hawaii to avoid transmission interference from cloud coverage. **NASA'S JET PROPULSION LABORATORY** in Pasadena, California hosts LCRD's other ground station.

LCRD technologies will, once proven, be leveraged aboard two upcoming NASA missions, the Integrated LCRD Low-Earth Orbit User Modem and Amplifier Terminal (ILLUMA-T) and the Laser-Enhanced Mission Communications Navigation and Operational Services (**LEMNOS**) project.

ILLUMA-T will fly aboard the **INTERNATIONAL SPACE STATION** as the first demonstration of a fully operational end-to-end optical communications system. It will provide the station with a state-of-the-art optical communications terminal with improved size, weight, power and data rates over comparable radio systems.

LEMNOS will fly aboard the **ORION** Multi-Purpose Crew Vehicle, leveraging laser communications in future human spaceflight. Its higher data rates will enable astronauts to video conference with Earth and stream high-definition video of exploratory missions beyond low-Earth orbit.
The recent launch of NASA's last **TRACKING AND DATA RELAY SATELLITE** closed a chapter in the history of space communications. Future generations of Space Network satellites will

LCRD's flight modems must undergo thermal vacuum testing to ensure they will operate properly in the harsh environment of space. In this photo, an LCRD engineer is preparing Flight Modem 2 for thermal vacuum testing in October.
Credit: Barbara Lambert

incorporate laser technologies developed in this decade. The LCRD mission is an important milestone of that journey.

The LCRD mission is being developed in cooperation with MIT's Lincoln Lab. Orbital-ATK of Dulles, Virginia, will launch LCRD in 2019 aboard the U.S. Air Force's Space Test Program Satellite-6 from the Cape Canaveral Air Force Station in Florida. For more information about LCRD and optical communications, visit the Exploration and Space Communications (ESC) Division's **WEBSITE**.

LCRD engineers place Flight Modem 2 in the thermal vacuum chamber for testing. LCRD's flight modems are a critical part of the payload. They encode data into laser light to be transmitted to the ground.
Credit: Barbara Lambert

DANNY BAIRD / CODE 450
TECHNICAL WRITER , ESC DIVISION

SANDRA CAUFFMAN
PUTS HER STAMP ON
INTERNATIONAL WOMEN'S DAY

Regular readers of The Critical Path may recall the Winter 2015 issue which featured an article on the Hispanic Advisory Committee for Employees (HACE), where Sandra Cauffman, now deputy director of NASA's Earth Science Division, shared her life story. Sandra grew up in Costa Rica facing many challenges and eventually came to the United States to pursue her educational dreams.

When Sandra Cauffman received a message in September 2016 from Ana Helena Chacón Echeverría, one of the two vice presidents of Costa Rica, she wasn't sure what to think. Cauffman, a native of the Central American nation, serves as the deputy director of NASA's Earth Science Division, within the Science Mission Directorate at the agency's headquarters in Washington.

"I couldn't imagine what she wanted," said Cauffman, who had met Echeverría previously.

It turns out, Echeverría contacted Cauffman to inform her she had been selected to receive what may be considered the ultimate honor -- a postage stamp bearing her image.

"What did I do to deserve this honor?" Cauffman asked herself when she got the news. "I couldn't believe it."

Echeverría requested that the official postal service of Costa Rica, Correos de Costa Rica, honor Cauffman as one of three women to appear in a special set of stamps released on March 8, in commemoration of International Women's Day. Cauffman is featured along with fellow Costa Ricans Cristiana Figuerez, a diplomat who served as Executive Secretary of the UN Framework Convention on Climate Change, and Shirley Cruz, a soccer player who plays for French club Paris Saint-Germain and is a member of the Costa Rica women's national soccer team.

"I'm very honored with this tribute," Cauffman told attendees of the "Nosotras: Women Connecting" event, which took place March 15 in San José and featured a special ceremony for the stamp honorees. "I have tried to inspire many young women to achieve their dreams."

Since joining Goddard Space Flight Center in February 1988 as a contractor and becoming a NASA employee 3 years later, Cauffman has worked in a variety of positions, including serving as deputy project manager of NASA's MARS ATMOSPHERE AND VOLATILE EVOLUTION (MAVEN) mission, deputy systems program director for the GOES-R mission, and in many roles that promoted diversity and inclusion at Goddard. Along the way, she achieved several "firsts," including becoming the first Costa Rican to work on a Mars mission to become a member of the Senior Executive Service within the federal U.S. workforce.

Cauffman feels the stamp honor has as much to do with her science, technology, engineering, and mathematics (STEM) outreach efforts as it does with her professional accomplishments. "It's a simple message," she says of her work to inspire others -- especially girls -- to pursue their dream. "You have to have goals, a purpose. Otherwise it doesn't matter." Cauffman says goals "give us direction and are a powerful force in the conscious and subconscious that drives us to try to make our dreams come true."

She found that to be the case firsthand when she returned to Costa Rica in March to receive the stamp honor and was honored with an additional accolade. The Costa Rica College of Engineers and Architects -- the professional society representing the field she was discouraged from entering several decades prior because she is a woman -- conferred upon her an honorary membership. In doing so, Cauffman became only the fourth person to receive this honor since 1973 and the first woman to become an honorary member.

"With effort and perseverance anything is possible," she said, reflecting on her career and her hopes for future generations. "Don't give up and fight for your dreams even if they seem unattainable."

Excerpted from WWW.NASA.GOV

Editor: Kindra Thomas / Code LM020, NASA Headquarters

> **"Don't give up and fight for your dreams even if they seem unattainable.**
>
> **-Sandra Cauffman**

Sandra Cauffman, deputy director of NASA's Earth Science Division Credit: NASA/Sean Potter

FLIGHT PROJECTS DIRECTORATE

SENIOR LEADERSHIP ROUNDTABLE

In March 2017, the Flight Projects Directorate (FPD) held a strategic senior leadership retreat. During a collaborative leadership exercise at the retreat, a pictorial was shared from one of our teams to display the many things we juggle on our plate and our commitment to our stakeholders. The image resembled a picture of the Knights of the Round Table and from then on, the senior leadership team self-declared themselves the "FPD Roundtable." The FPD Roundtable is comprised of senior leaders within FPD, engaging in strategic initiatives for the good of the organization, center and agency. This effort creates a shared leadership vision, providing a forum for identifying our competitive advantage as well as our institutional barriers, and for discussing what collaborative actions could be executed within 400's control. There is an intentional push by directorate leadership to keep the momentum going, which has already resulted in a change to the FPD Tag-Ups once a quarter to allow for the Roundtable to dedicate a half day to work strategic initiatives. The Roundtable meets monthly and has divided FPD priorities into four initiatives. We are sharing our Strategy-on-a-Page with the FPD community and look forward to passing along updates as the teams solidify their goals and action plans.

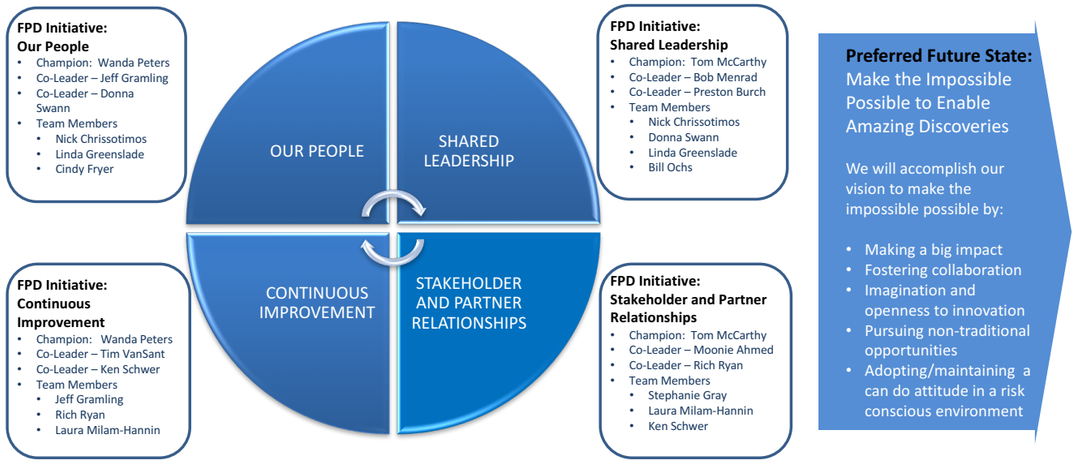
Flight Projects Directorate (FPD)/Code 400 Strategy on a Page

Purpose of FPD Roundtable - Enhance Goddard's program/project management, nurture our people, influence the external environment to sustain world class capabilities, and achieve mission success by cultivating a strategic and collaborative directorate.

The strategic competitive advantage of GSFC's FPD is multifaceted; enabling us to create an environment in which to accomplish our dynamic mission. Control of our resources enables us to be empowered by default to accomplish our mission. We strive to maintain and improve on being the premier program/project management organization at NASA which we accomplish through our **experience** and our **people**:

- We leverage and harness the experiences and passion of our people, to accomplish multiple missions and to collaborate for future work in a dynamic environment, enabling us to execute on a diversity of short/long term missions.
- We come to the game rooted in the experience base of our flight projects culture, with an agility and flexibility that serves our stakeholders and partners in the accomplishment of the mission.
- Our people get the job done in an environment of ever changing challenges.

FPD Roundtable Strategic Initiatives



September 2017

WANDA PETERS/ CODE 400
FPD DEPUTY DIRECTOR FOR PLANNING AND BUSINESS MANAGEMENT

CAMARADERIE ABOUNDS

AT NASA'S JOHNSON SPACE CENTER

SURROUNDING HURRICANE HARVEY'S IMPACT

When Hurricane Harvey slammed into the coast of Texas on August 25, 2017, as a category 4 storm, workers at NASA's Johnson Space Center (JSC) in Houston banded together to ensure the cryogenic testing of NASA's James Webb Space Telescope (JWST) continued uninterrupted.

The intense hurricane ravaged the southeast Texas coast and later stalled over southeastern inland Texas, almost directly atop Houston, where it weakened to a tropical storm. The storm dropped as much as 50 inches of rain in and around the city by the time it was over.

The National Oceanic and Atmospheric Administration's (NOAA's) GOES-East satellite captured this visible image of Hurricane Harvey in the western Gulf of Mexico on August 26, 2017, at 6:45 p.m. EDT (2245 UTC).

Credit: NASA/NOAA GOES project

James Tersigni, a Ball Aerospace software engineer supporting Webb's cryogenic testing, and several others at Johnson during the hurricane shared how those at the center prepared, sustained, and recovered in the days surrounding Harvey's impact.

A FATEFUL ARRIVAL IN THE BAYOU CITY

Having just arrived back in Houston from a memorable trip to see the solar eclipse on August 21, 2017, in Nashville, Tennessee, James Tersigni was unaware of the massive storm brewing in the Gulf of Mexico and making its way toward the Texas coast. Upon landing at Houston's Hobby Airport, Tersigni headed to the rental car lot to find a vehicle for his anticipated month-long stay in the city supporting Webb at Johnson.

As he searched the lot for a car he liked, he noticed a large, four-wheel drive, crew cab pickup truck amidst the sea of smaller cars — a lucky find, considering the impending storm. Tersigni asked a lot attendant if the truck was available, but the attendant said it was reserved. Resigned to the fact he would not get the truck, Tersigni began to load his luggage into the hatchback trunk of a shiny blue, compact, hybrid car he chose. He had just about finished loading his things when the lot attendant told him he could have the "monster truck" he desired.

"Relieved that I wasn't going to have to drive a [compact car] around Texas for a month, I took my bags, quickly threw them into the bed of the truck, and drove off to the exit before they changed their minds," said Tersigni.

Tersigni had no way to know it at the time, but this fateful event before Hurricane Harvey's landfall would make him somewhat of a hero around Johnson in the coming days.

CONTINUED ON PAGE 34

CONTINUED FROM PAGE 33

A MISLEADING CALM BEFORE THE STORM

Tersigni heard nothing about the looming storm until he arrived at Johnson for his shift the morning after he landed in Houston. When he entered the center's control room, he saw what looked to be an intense storm displayed on one of the room's large monitors. Later, he heard forecasts of then Tropical Storm Harvey, soon to be Hurricane Harvey, was heading for a landfall in Texas.

At the end of Tersigni's shift on this first day, Carl Reis, a test director for cryogenic testing of JWST's optical telescope and integrated science (OTIS) element at JSC, warned of the storm and went over emergency preparedness procedures with the team. In the two days following Reis' warning, Harvey significantly strengthened off the coast.

"Radar images showed a monster [storm] in the Gulf, but the calm Houston air was misleading," said Tersigni.

HARVEY'S INTENSE IMPACT

On August 26, Tersigni ended his shift at Johnson and settled in for the night at a nearby hotel. He was confident Hurricane Harvey, which had weakened after making landfall near Rockport, Texas, would bring only some wind and rain to Houston. As he left the hotel the morning of August 27, he saw conditions had considerably worsened.

"As I was about to leave my room, I noticed heavy rain outside, much heavier than I have ever seen," Tersigni recalled. "I opened the door, and the wind nearly pulled the knob out of my hand."

Cars sit partially submerged and abandoned in flood water on Interstate 45. Many roads around Houston flooded as Harvey stalled over the city and dropped as much as 50 inches of rain.

Credit: James Tersigni

Tersigni ran through the hotel parking lot, getting drenched in the process, and jumped into his serendipitously acquired truck. Wipers going full speed to clear the torrents of rain from the truck's windshield, he carefully drove to Johnson to begin his shift and to help ensure the Webb telescope's continued success during cryogenic testing.

Tersigni decided against driving one of the main roads into Johnson, because of its reputation for flooding. He instead took an alternate route, but conditions on that route quickly worsened, and Tersigni soon found himself in the dark with little visibility because of the pouring rain.

"Trying my best to be careful, I continued, and without warning, I plunged like a log ride into a river flowing across the road," Tersigni explained. "Water was flowing over the hood of the truck, I felt the truck hop sideways a few times and my heart sunk … I literally stood on the gas pedal hoping the truck wouldn't stall out."

Because of his delay getting to the center, security at Johnson began to call Tersigni to make sure he was okay. They told him the main entrance to the center was flooded and inaccessible. At security's request Tersigni drove to another entrance, but he found the gate was jammed. He tried yet another entrance to the center, but the floodwaters there were getting too deep to drive through safely.

"Not able to turn around, I thought, 'Hey, I have a truck.' So I crossed the median into the oncoming lane of traffic where the water was much shallower," explained Tersigni. "Luckily, I only had to navigate one oncoming car, made it to [the gate], and after two nerve-wracking hours, I was finally safe on base at Johnson."

"YOU BET – I'VE GOT A HUGE TRUCK"

Tersigni's fateful find in the rental car parking lot turned into a saving grace for workers at Johnson who needed transportation to and from the center. Tersigni was initially asked if he could transport two team members who had been working a double shift back to their hotels. With little hesitation he replied, "You bet – I've got a huge truck."

"I was one of the few allowed to drive on base, so this became a pattern. I would pick people up at their hotels and bring them to work, and I'd pick others up at work and bring them to their hotels so they could sleep," said Tersigni. "My title quickly went from software engineer to 'Uber Jim.'"

Coworkers were not the only cargo Uber Jim and his monster truck carried during the storm. Tersigni later carried fresh-made food and groceries in the truck cab. Workers at Johnson had largely been sustaining themselves on dried food, but many considered it a reasonable sacrifice to keep Webb's cryogenic testing going.

"We were all focused on two things — staying safe and continuing the test. We all had a common understanding that the lack of fancy food and the long hours were worth it to keep making progress," said Marcia Rieke, a professor of astronomy at the University of Arizona and the principal investigator for Webb's near-infrared camera (NIRCam), who was at Johnson during the storm. "People shared what food they had, and we learned that some of our fellow team members have hidden talents, like making pasta with vodka sauce."

On August 28, Tersigni went out in search of sustenance that might better energize his coworkers for their shifts. He found it just off of NASA 1 Road, which runs along the southeast side of Johnson, at an Italian restaurant that was open despite the ongoing storm. He was the first customer to walk into the restaurant when the doors opened at 3 p.m. The restaurant had a limited menu, but Tersigni worked with the owner to get food for those at Johnson.

"I explained to him what Webb was and what we were doing, then told him that I had approximately 50 people stranded in the control room that needed to be fed," explained Tersigni. "He smiled at me and said, 'How can I help?' I simply asked for a few trays of pasta, and within 20 minutes he had two huge trays of pasta and two huge trays of bread prepared."

Tersigni loaded the food into the truck and called ahead to Lee Feinberg, optical telescope element manager for the Webb telescope at NASA's Goddard Space Flight Center, and a test director for Webb's cryogenic testing at Johnson, to ask him for assistance with the impending delivery. Feinberg said Tersigni's willingness to help

James Tersigni stands by the pasta feast he delivered to JWST employees at JSC. Delivered as rain from Harvey soaked the center, this provided a welcomed change from the dried food the workers had been eating.

Credit: Lee Feinberg

Employees enjoy brisket and side dishes from an area barbeque restaurant on August 29, 2017.

Credit: James Tersigni

CONTINUED ON PAGE 36

CONTINUED FROM PAGE 35

was representative of the entire team at the center.

"Right from the beginning, the most amazing thing was how our own team members were stepping up and helping each other," said Feinberg. "A great example of this was after eating dried food for days, Jim literally found the only restaurant open, and when he walked in with trays of hot pasta, it just really reinforced this point and made everyone else want to step up and do the same."

Tersigni's trip to the Italian restaurant was one of several times in the following days that he and his truck, often with smooth jazz playing in the cab, traversed Houston in search of food. On August 29, he brought in "enough brisket for an army" from a nearby barbeque restaurant. As grocery stores began to open in the wake of the storm, Tersigni started to take grocery lists from his coworkers and go shopping for them. He would stand in line to get into the store, gather what he could from the dwindling supplies inside, then stand in line again, sometimes up to an hour, to check out.

PERSEVERING THROUGH THE STORM

Webb team members who remained on center for the duration of the storm persevered through multiple shifts to make sure the telescope's cryogenic testing continued without interruption and without an impact on the project's schedule. To ensure everyone at the center was adequately rested, several conference rooms around Johnson were transformed into bunkrooms with NASA-provided cots and air mattresses. As Tersigni recalled, these rooms would often be filled with a "symphony of snoring."

The JSC cryogenic test leadership team stands in front of screens monitoring the weather conditions around the center. Left to right: Lee Feinberg, GSFC optical telescope element manager and co-lead JSC OTIS test director; Ken Anderle (Jacobs), JSC OTIS facility and test section manager; Carl Reis, JSC co-lead OTIS test director; Andrew Francis (Jacobs), JSC facility lead test director.

Before Webb began its cryogenic testing, Johnson had a hurricane contingency plan in place, which those at the center followed and adapted to the current weather as needed. Jesse Huguet, the Harris Corporation thermal lead for Webb telescope at Johnson, said his biggest fear was of power failure. Fortunately, Johnson never lost power during the storm, and all of the test and support systems for the telescope remained functional for Harvey's duration. However, even if the center had lost power, plans were in place to reduce the impact.

"Our team spent the last two years talking through and analyzing the effects of a power failure and what it would mean for our hardware and the test timeline," explained Huguet. "We knew what actions to take and what results to expect if that eventuality occurred, but actually going through the process would have been a harrowing experience."

Team leaders at Johnson required their team members to check into and out of work, so they could make sure everyone was accounted for and safe. Many workers at the center pulled 12-hour shifts to ensure no one was on the roads at night, when the rain was heaviest and the visibility was the worst. Huguet said working together for those long hours, having fewer test activities, and the multiple carpool rides fostered camaraderie among the team.

"I think that all resulted in us having more time to have personal conversations and to get to know each other than we would have been able to if we were neck deep in test activities, as we usually are," said Huguet. "I'd say the whole experience made the test team a more cohesive unit and got us out of our disciplinary shells a bit."

Much of Johnson avoided the brunt of Harvey's wind and rain, but other parts of Houston were not so fortunate. For Huguet, the juxtaposition of Johnson's relative safety with the devastation of the city the center calls home was hard to bear.

"Seeing all the stories of stranded families, nursing home residents, and flooding hospitals and shelters was especially gut-wrenching when we were only a few miles down the road," Huguet said. "We were all working long shifts supporting a very important mission, but it was hard to see the predicament of the surrounding communities and not be able to help."

Several JWST members volunteered their time Labor Day weekend to help clean up and repair damage to the city caused by Hurricane Harvey. In addition to the group pictured here, other Webb team members have volunteered and continue to volunteer their time as clean-up efforts continue.

Credit: The Harbor church

OFFERING A HELPING HAND IN THE WAKE OF THE STORM

Following Harvey, some Webb telescope team members were able to help the surrounding community. Several volunteered time September 2 through September 4, over Labor Day weekend, to assist with local clean-up and repair efforts in Houston. Dave Hickey, an instrument operations and engineering branch manager for Webb telescope at the Space Telescope Science Institute in Baltimore, and also a volunteer firefighter, was one of the team members who spent their holiday helping Houston residents as part of a volunteer effort organized by The Harbor, an area church located about 10 miles from Johnson with a list of about 100 homes in the area that needed assistance.
Hickey explained that two crews from the Webb team went to assist two families of Johnson Space Center employees, while the rest of the team divided themselves among other volunteer groups from the church.

"The devastation was readily apparent as you turned into a neighborhood and saw the contents of house after house emptied onto the curb," said Hickey. "Groups helped with a wide range of work, including removing destroyed furnishings, removing drywall and insulation, pulling up flooring and cabinets, bleaching the wood framing after drywall was removed, and helping fill out FEMA [Federal Emergency Management Agency] paperwork."

Not all of the homes in the area sustained the same amount of damage from the flood waters, but the Bayou City, which is veined with channels and pockmarked with ponds and lakes, saw waters rise as high as 20 feet over the tops of some waterways.

"One house had a foot of water, while the ones across the street had nothing, but those at the entrance of the community had five feet of water," explained Hickey. "Another family told of water that started

CONTINUED ON PAGE 38

CONTINUED FROM PAGE 37

to rise in the middle of the night and a boat that dodged submerged cars to rescue them and their wheelchair-bound child from an upper window."

In addition to the physical clean-up efforts, some team members also helped victims of the hurricane with paperwork critical to their financial recovery from the storm. Lee Feinberg of Goddard assisted an employee of the hotel at which some of the Webb team were staying with paperwork required for FEMA assistance.

"She was a single mother with three dependents, whose house was severely impacted, and English is her second language," explained Feinberg.

The Webb volunteer team took all of the proper precautions, including wearing safety gear and staying properly hydrated, to ensure their well-being as they worked within areas devastated by the hurricane. In addition to the initial group pictured in the photo, other Webb team members have volunteered and continue to volunteer their time as clean-up efforts continue around the city.

"It all came down to people helping each other in their hour of need, and recognizing how fragile we are and that the roles could be reversed quickly and unexpectedly at any given time," Dave Hickey said.

For more information about the hurricanes and tropical storms tracked by NASA, visit: HTTPS://WWW.NASA.GOV/HURRICANES

For more information about NASA's Webb telescope, visit: WWW.WEBB.NASA.GOV OR WWW.NASA.GOV/WEBB

Eric Villard / Code 443
JWST Technical Writer

DID YOU KNOW...?

2018 marks the 100th anniversary of the end of World War I.

The 369th Infantry Regiment, known as the Harlem Hellfighters, was the first African American regiment to serve during WWI. The regiment faced discrimination from many white American soldiers who refused to perform combat duties with African Americans. The French, however, welcomed the 369th who served as the longest deployed unit in WWI. The Hellfighters gained their nickname from the Germans due to their toughness on the front lines. One of the most celebrated individuals in the 369th was Private Henry Johnson, who fought off a 24-man German patrol, despite running out of ammunition and being severely wounded. Johnson received the Croix de Guerre from the French for valorous service for his actions. Returning to the United States, he faced total disability and died in poverty. In 1996, he was posthumously awarded the Purple Heart and was honored with the Medal of Honor in 2015.

We want to be in the know! If you have something to share, please send it to Code 400 Diversity and Inclusion Committee, c/o Matthew Ritsko at: matthew.w.ritsko@nasa.gov and we'll include it in a future issue of the Critical Path.

Harlem Hell Fighters
Credit: Public Domain

2017 AGENCY AWARDS

The Agency Honor Awards Ceremony took place on October 31, 2017. Noted are awards to Code 400.

DISTINGUISHED SERVICE MEDAL

EDWARD NACE

For significant and lasting contributions to Mission Operations, extraordinary service to NASA, dedication to your fellow employees, and outstanding work ethic.

Chris Scolese with Edward Nace

OUTSTANDING LEADERSHIP MEDAL

Chris Scolese with Arlin Bartels

ARLIN BARTELS

For outstanding leadership and dedication to the Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx) mission.

CONTINUED ON PAGE 40

CONTINUED FROM PAGE 39

OUTSTANDING LEADERSHIP MEDAL

Chris Scolese with Michael Donnelly

MICHAEL DONNELLY

For exceptional leadership in ensuring the successful launch of OSIRIS-REx, NASA's First Asteroid Sample Return mission.

Chris Scolese with Vincent Elliott

VINCENT ELLIOTT

For outstanding leadership and dedication to the Resource Identification, Security, Regolith Explorer (OSIRIS-REx) mission.

PAUL GEITHNER

For outstanding leadership to overcome many challenges between competing organizations to deliver JWST's MIRI cryo cooler on time for observatory-level integration.

Chris Scolese with Paul Geithner

Chris Scolese with Jacqueline Townsend

JACQUELINE TOWNSEND

For outstanding leadership, exceptional foresight, and contributions to the Joint Polar Satellite System Program.

Chris Scolese with Mark Voyton

MARK VOYTON

For more than a decade of outstanding service to guide the ISIM and OTIS teams through unprecedented testing at GSFC and JSC for the JWST Project.

MARY WALKER

For outstanding leadership as the OSIRIS-REx Payload Manager in successfully delivering all five instruments, completing spacecraft test and initial in-flight activation.

Chris Scolese with Mary Walker

OUTSTANDING PUBLIC LEADERSHIP MEDAL

MICHAEL BLANTON

For outstanding leadership and contributions in the development, testing, and deployment of the GOES-R Ground System.

Chris Scolese with Michael Blanton

Chris Scolese with Michael Nolan

MICHAEL NOLAN

For outstanding contributions to the development of near-Earth object radar astronomy and characterization of the OSIRIS-REx mission target asteroid Bennu.

EXCEPTIONAL ACHIEVEMENT MEDAL

JOHN BRISTOW

For outstanding achievement transforming management and technical processes to deliver the GOES-R Ground System on schedule.

Chris Scolese with John Bristow

Chris Scolese with Juli Lander

JULI LANDER

For extraordinary achievements that bridged the gap between NASA centers to successfully reduce risk to JWST's flight hardware during cryo vacuum testing at JSC.

CONTINUED ON PAGE 42

EXCEPTIONAL SCIENTIFIC ACHIEVEMENT MEDAL

NICHOLAS SCHNEIDER
For exceptional contributions to the MAVEN science return using the MAVEN Imaging Ultraviolet Spectrograph instrument.

Chris Scolese with Nicholas Schneider

EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL

Chris Scolese with Brian Comber

BRIAN COMBER
For exceptional thermal engineering support of James Webb Space Telescope (JWST) Cryogenic Thermal-Vacuum tests.

EXCEPTIONAL SERVICE MEDAL

CYNTHIA FRYER
For persistence in achieving high productivity and outstanding operations for Center-wide independent assessments.

Chris Scolese with Cynthia Fryer

Chris Scolese with James Marsh

JAMES MARSH
For nine years of sustained service in the successful risk reduction test campaigns through the refurbishment of critical thermal and cryo facilities at several NASA centers.

EARLY CAREER ACHIEVEMENT MEDAL

ARINDAM MALLIK
For significant early career contributions to human spaceflight and space exploration.

Chris Scolese with Arindam Mallik

EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL

Chris Scolese with Paul Cleveland

PAUL CLEVELAND
For exceptional achievement in guiding and delivering innovative solutions for the successful completion of JWST's Core2 thermal balance test campaign.

TONI HEGARTY
For the vision and dedication in developing the state-of-the-art Technical Data Management System to ensure GSFC's in-house Instruments are properly developed.

Chris Scolese with Toni Hegarty

JOSHUA LEVI
For your exceptional achievements in managing the James Webb Space Telescope Optical Telescope Element (OTE) integration and testing activities at GSFC.

CONTINUED ON PAGE 44

CONTINUED FROM PAGE 43

EXCEPTIONAL PUBLIC ACHIEVEMENT MEDAL

JOSHUA WOOD
For providing exceptional and outstanding contributions to the development and launch of OSIRIS-Rex.

EXCEPTIONAL PUBLIC SERVICE MEDAL

CHARLES ATKINSON
For outstanding engineering expertise and dedication demonstrated for the design, build and testing of JWST's Optical Telescope Element.

Chris Scolese with Charles Atkinson

RAYMOND MCGLYNN
In recognition of your leadership in taking the first GOES-R-series satellite through a successful integration, test, and launch processing program.

SILVER ACHIEVEMENT MEDAL

Chris Scolese with Maureen Disharoon

MAUREEN DISHAROON
For dedication to NASA, GSFC, the Flight Projects Directorate, and the JWST Project, and always going the extra mile to provide customer satisfaction.

SILVER ACHIEVEMENT MEDAL

JILL TAYLOR
For outstanding performance on Geostationary Operational Environmental Satellite (GOES-R) in both system engineering and mission readiness testing.

Chris Scolese with Jill Taylor

SILVER ACHIEVEMENT MEDAL (Team Award)

ATLAS Q-SWITCH ANOMALY INVESTIGATION TEAM
For outstanding detailed engineering evaluation and assessment of the risks associated with the potential failure of the ATLAS laser Q-Switch.

OLA INSTRUMENT TEAM
For engineering expertise, resilience in the face of adversity and dedication in the development of the OSIRIS-REx Laser Altimeter instrument for the OSIRIS-REx mission.

OSIRIS-REX ASTEROID ASTRONOMY SCIENCE TEAM
In recognition of your outstanding contributions to the astronomical characterization of the OSIRIS-REx mission target asteroid Bennu.

OSIRIS-REX NAVIGATION MISSION SUPPORT AREA DEVELOPMENT TEAM
For exemplary teamwork and dedication to the OSIRIS-REx mission exhibited by members of the NavMSA development and implementation team.

OSIRIS-REX PAYLOAD TEAM
For exceptional achievement in successfully delivering all five instruments, completing spacecraft tests, and initial in-flight activation.

OSIRIS-REX PROJECT BUSINESS TEAM
For exemplary business support bringing OSIRIS-REx development on schedule and under budget.

OSIRIS-REX PROJECT MANAGEMENT TEAM
For outstanding leadership and management in the development and launch of the OSIRIS-REx mission, NASA's First Asteroid Sample Return mission.

OVIRS INSTRUMENT TEAM
For achieving excellence by delivering the OVIRS instrument that meets requirements within budget and ahead of schedule, while overcoming obstacles.

CONTINUED ON PAGE 46

CONTINUED FROM PAGE 45

GROUP ACHIEVEMENT AWARD

EOSDIS CMR TEAM
For the outstanding software engineering achievements on the Earth Observing System Data and Information System (EOSDIS) Common Metadata Repository.

JWST CORE2 TEST TEAM
For outstanding contribution to the delivery, integration and testing of critical JWST Core2 hardware that enabled verification of the observatory's core thermal area.

LANDSAT 9 SOURCE EVALUATION BOARD ACQUISITION TEAM
For the extraordinary efforts resulting in a timely spacecraft contract award enabling an early launch readiness date.

OPTICAL GROUND SUPPORT EQUIPMENT TEST TEAM
For the successful planning and safe execution of several of the most challenging James Webb Space Telescope tests by an extraordinary talented team.

OSIRIS-REX ATLO TEAM
For executing the challenging assembly, test, and launch operations campaign that resulted in the on-time launch of the OSIRIS-REx spacecraft.

OSIRIS-REX FLIGHT SYSTEM DEVELOPMENT TEAM
For dedicated teamwork that resulted in the delivery and launch of the OSIRIS-REx spacecraft, on time and under budget.

OSIRIS-REX MISSION TEAM
For exceptional scientific, engineering, and management expertise and dedication in the development of the flight system for the OSIRIS-REx Asteroid Sample Return Mission.

OSIRIS-REX OTES DEVELOPMENT TEAM
In recognition of unparalleled engineering ingenuity/expertise and tireless dedication toward the development, launch, and successful on-orbit activation of OTES.

WFIRST PROJECT TEAM
For the Wide Field Infrared Survey Telescope (WFIRST) Project's outstanding performance in developing and optimizing the WFIRST formulation design reference.

FLIGHT PROJECTS
LAUNCH SCHEDULE 2018